Expression of Interest for the Delivery of an Initial Operating Segment RFEI HSR#15-02

Italferr S.p.A. GRUPPO FERROVIE DELLO STATO ITALIANE

Rome sept-2015

Italferr's International Department
Via Vito Guiseppe Galati, 71 – 00155 Roma

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Official Global Rail Carrier
EXPO
MILANO 2015

Market Development and International Activities
Americas Area Manager

Rebecca Harnagel
California High-Speed Rail
Authority 770 L Street, Suite 620
MS 2 Phone: (916) 324-1541
Fax: (916) 322-0827 Email:
deliveryapproach@hsr.ca.gov

Re: Expression of Interest for the Delivery of an Initial Operating Segment – RFEI HSR#15-02

Dear Ms. Harnagel,

Italferr, the engineering company of the Ferrovie dello Stato Italiane Group (FSI Group), as one of the European pioneers of the Interoperable High-Speed Railway Transportation era, is pleased to present this Expression of Interest for the Delivery of an Initial Operating Segment (IOS) for the California High-Speed Rail System ("System").

Italferr led the implementation of the more than 620 miles Italian High-Speed/High-Capacity Railway Network, from its feasibility studies to design and construction supervision to commissioning and the put in operation, including Investment Management and Stakeholders' Management.

We see this as an opportunity to assist the California High-Speed Rail Authority ("Authority") in moving the Project one step closer and so becoming a reality for the Project's Stakeholders, among whom first and foremost the Communities of the State of California and of the United States.

With extensive worldwide design, construction supervision and management experience, both in Interoperable High-Speed and Conventional Railway Networks, Italferr looks

forward to a fully integrated partnership with the Authority, the Project's Stakeholders, and Californian businesses to successfully enable US' first High-Speed Rail System.

We are thrilled at the opportunity of sharing with the Authority our experience and the drivers of our successes on High-Speed train projects around the world enabling our success to the California High-Speed Train Project.

In terms of team structure, after some initial attempts to create a multifaceted industrial group, capable of confronting all the challenges embraced in the proposed Delivery of an Initial IOS, the present Expression of Interest was eventually produced solely by Italferr. As a matter of fact, based of the difficulties to create in such a short notice (and at this stage of the process) a large group of companies with a common vision on the future Californian HST, the decision to bring to the Authority the point of view of a consulting firm who delivered almost completely the engineering process of a national High Speed Program, was finally taken.

Considering the scope of the Developer envisioned by the CHSRA for the Delivery of an IOS, well beyond the possibilities of a consulting firm also with the experience of ITALFERR, what has been elaborated must be considered a specific contribution to the Authority, hopefully interesting, deriving from our particular and, as you'll see, "unique", engineering perspective.

Please direct any questions to:

Marco Stegher - Americas Area Manager
m.stegher@italferr.it - Mob: +39 3357125169

Thank you for the opportunity to submit this EOI.

Warm Regards,

[redacted]

Marco Stegher

Americas Area Manager

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1. *Is the delivery strategy (i.e., combining civil works, track, traction power, and infrastructure) likely to yield innovation that will minimize whole-life costs and accelerate schedule? If so, please describe how. If not, please recommend changes to the delivery strategy and describe how those changes will better maximize innovation and minimize whole-life costs and schedule.* 10
2. *Does the delivery strategy adequately transfer the integration and interface risks associated with delivering and operating a High-Speed rail system? What are the key risks that will be borne by the State if such risk transfer is not affected? What are the key risks that are most appropriate to transfer to the private sector?* 11
3. *Are there any other components of a High-Speed rail system that should be included in the scope of work for each project (e.g., rolling stock, train operations, stations)? If so, how will this help meet the Authority's objectives as stated in this RFEI?* 17
4. *What is the appropriate contract term for the potential DBFM contract? Will extending or reducing the contract term allow for more appropriate sharing of risk with the private sector? If the Respondent recommends a different delivery model, what would be the appropriate term for that/those contract(s)?* 17
5. *What is the appropriate contract size for this type of contract? What are the advantages and disadvantages of procuring a contract of this size and magnitude? Do you think that both project scopes should be combined into a single DBFM contract?* 18
6. *Does the scope of work for each project expand or limit the teaming capabilities? Does it increase or reduce competition?* 19

4.2 Funding and Financing Questions 21

7. *Given the delivery approach and available funding sources, do you foresee any issues with raising the necessary financing to fund the IOS-South project scope? IOS-North project scope? Both? What are the limiting factors to the amount of financing that could be raised?* 21
8. *What changes, if any, would you recommend be made to the existing funding sources? What impact would these changes have on raising financing?* 21
9. *Given the delivery approach and available funding sources, is an availability payment mechanism appropriate? Could financing be raised based on future revenue and ridership (i.e., a revenue concession)? Would a revenue concession delivery strategy better achieve the Authority's objectives?* 21

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10. *Based on the Authority's capital, operating, and lifecycle costs from its 2014 Business Plan, describe how the preferred delivery model could reduce costs, schedule, or both. Please provide examples, where possible, of analogous projects and their cost and/or schedule savings from such delivery models.* 22

11. *How does this compare to separately procuring each High-Speed rail component (i.e., separate contracts for civil works, rail, systems, power separately)? Please discuss design/construction costs, operating/maintenance/lifecycle costs, and schedule implications.* 24

12. *For each project, are there any technical changes to the respective scope of work that would yield cost savings and/or schedule acceleration while still achieving the Authority's objectives? If so, please describe.* 25

1. Foreword

Italferr, as one of the pioneers of the Interoperable High-Speed Railway Transportation era, is pleased to present this Expression of Interest for the Delivery of an Initial Operating Segment (IOS) for the California High-Speed Rail System ("System").

We see this as an opportunity to assist the California High-Speed Rail Authority ("Authority") in moving the Project one step closer to becoming a reality for the Project's Stakeholders, among whom first and foremost the Communities of the State of California and of the United States.

With extensive worldwide design, construction supervision and management experience, both in Interoperable High-Speed and Conventional Railway Networks, Italferr looks forward to a fully integrated partnership with the Authority, the Project's Stakeholders, and Californian businesses to successfully enable US' first High-Speed Rail System.

Italferr, the engineering company of the Ferrovie dello Stato Italiane Group (FSI Group), led the implementation of the more than 620 miles Italian High-Speed/High-Capacity Railway Network, from its feasibility studies to design and construction supervision to commissioning and the put in operation, including Investment Management and Stakeholders' Management.

We are thrilled at the opportunity of sharing with the Authority our experience and the drivers of our successes on High-Speed train projects around the world enabling our success to the California High-Speed Train Project.

2. Firm Experience and Team Structure

The EOI should include a brief statement describing the Respondent's experience with similar projects and similar services. To the extent that the Respondent is submitting an EOI as part of a joint venture or consortium, then the EOI shall include a description of the proposed team structure, including what strengths and experience each entity brings to the overall team.

After various initial attempts to create a multifaceted industrial group, capable of confronting all the challenges embraced in the Delivery of an Initial IOS, **the present Expression of Interest was eventually produced solely by Italferr**. In fact, considering the difficulties to join in such a short notice (and at this stage of the process) a large group of companies with a common vision on the future Californian HST, the decision to bring to the Authority the point of view of a consulting firm who delivered almost completely the engineering process of a national High Speed Program, was finally taken.

Considering that the program envisioned by the CHSRA for the Delivery of an IOS will imply obviously a multitude of actors, well beyond the possibilities and scope of a consulting firm, also with the experience of ITALFERR, what follows must be considered only a **specific contribution to the Authority, hopefully interesting, deriving from our particular and, as you'll see, "unique", engineering perspective**.

With a turnover of about $168M, 1,200 employees and more than 600 Projects currently underway, Italferr performs engineering consulting services worldwide on Transport Systems and Infrastructural Projects. In its over 30 years of activity, Italferr has managed more than $85Bln Projects, on more than 60 Countries. Italferr is part of Gruppo Ferrovie dello Stato Italiane (FSI Group), the Italian State Railways Group that, with a turnover of about $9.2Bln, employs more than 75,000 people.

Italferr develops, designs, and manages Projects throughout all their phases, from their earliest stages to completion, including the testing and commissioning, the put in operation and the training courses. In all its services and products Italferr always guarantees the utmost quality and safety. Italferr offers to export its know-how worldwide, continuously fostering environmental consciousness and technological and managerial innovation.

Main sectors of Italferr's activity are High-Speed/High-Capacity Railway Systems and Networks, Conventional Railway Networks, Metro and Urban Transportation, Passenger Stations and Freight Terminals, Rolling Stock and Depots/Maintenance Facilities. Italferr develops both the civil part of the infrastructure (tunnels, bridges, viaducts, structures, and other civil works) and the technological one (Traffic management and technological systems, electric systems, MEP). The expertise Italferr has gained enables Italferr to offer a unique systemic view on the overall transport infrastructure.

Italferr's specific focus lies on Clients' and Stakeholders' needs and requirements, from a quality, safety and environmental point of view. Italferr's integrated Quality (ISO 9001), Environment (ISO 14001) and Health and Safety (OHSAS 18001) Management System, for which Italferr has achieved the certification by Societé Genèrelle de Surveillance (SGS) confirms this main driver in all Italferr's activities. Furthermore, and in accordance to standard UNI EN ISO 14064-1:2006, Italferr has developed a methodology to measure and report, on the design basis, the GHG emissions produced during both the design and the construction of on new transportation infrastructures. Among the several engineering consulting services Italferr provides, are value engineering and V&V. Italferr has been and still is one of the first Companies in Italy to be certified as an Inspection Body for design validation, accordance with ISO /IEC 17020 Standard.

Throughout the years, Italferr has developed, supervised and managed the entire Italian $36 Billion High-Speed/High-Capacity Railway Network. Among the scope of Italferr's assignment are included:

- Technical assistance to the Client on a permanent basis
- Feasibility studies
- Value engineering
- Preliminary design
- Preparation of Technical Standards for detailed design
- Detailed and final design in the most critical sections of the network, as the Urban Junctions and the Urban Connections between the HS/HC Network and the Conventional one
- Procurement services including preparation of tender documents, calls for tender, bid evaluation, contract award
- Coordination and supervision of environmental studies
- Design review
- Construction Supervision
- Safety analysis of particular project components

- Supervision and approval of RAMS parameter analysis undertaken by general contractors
- Testing, Commissioning and Start-up
- Training
- Put into operation

The scope of Italferr's assignment also included Management Consulting Services, as Program Management, Project Management, Stakeholders' Management, Requirements and Change Management, System Assurance, System Integration, Verification and Validation, Interface and Integration Management.

The Italian High-Speed/High-Capacity Railway Network in figures may be summed up as follows:

- more than 620 miles of High Speed/High Capacity Railway Lines (up to 186 mph) in operation
- 85 Tunnels (90 miles total length)
- 234 Bridges and overpasses (320 miles)
- 48 miles of connections with the existing Transport Network
- 7 new High-Speed Railway Stations
- 490 miles of new roads and road re-routing

Main focus has been reserved to Stakeholders and environment: in order to achieve the highest socio-environmental integration of the Project, Italferr established more than 300 agreements with the Authorities, the Stakeholders, the Communities throughout the 6 regions, 16 provinces, and 150 municipalities crossed by the Network. Approximately 25% or the investment has been spent on socio-environmental aspects. Among the main focus areas of the socio-environmental integration of the Project have been:

- Environmental and urban rehabilitation, environmental readjustment works: more than 6,25 sq. miles of landscaped greenery
- Control and mitigation of noise and vibrations: about 150 miles of noise barriers designed and implemented
- Control of power supply and of generated electromagnetic field

- Prevention and mitigation measures to reduce the hydro-geologic impact
- Reduction of impact on human environment during construction period
- Maximum reuse of excavated materials and reduce of solid waste
- Protection of heritage and archaeological remains

The European Rail Traffic Management System/European Train Control System (ERTMS/ETCS Level 2) that has been developed and first applied on the Italian Network has now become an international standard for HS/HC Networks. ERTMS/ETCS Level 2 eliminates the possibility of human error, ensuring continuous control over the train's movement. This results in the highest degree of safety at the highest speeds, enabling a greater frequency of trains, which may run even only a few minutes apart from one another.

The following descriptions provide examples of relevant successful projects performed by Italferr in the Italian High-Speed/High-Capacity Railway Network.

2.1 New Rome-Naples High-Speed/High Capacity Railway Line

Client:	Gruppo Ferrovie dello Stato Italiane (FSI Group)
Period:	1991-2008
Contract Value:	210 M€
Works Value:	€ 5.86 Billion

The new 187 mph, 127.4 miles project passes through two Regions, four different Provinces, over 60 Municipalities. In order to minimize the socio-environmental impact, it chiefly develops elevated (100 miles above ground, mainly in bridges and viaducts) and it foresees about 25 miles underground (in tunnels, both natural and cut and cover). The Project comprises more than 650 different Works: 33 natural tunnels, 77 artificial tunnels and 88 viaducts, along with 268 embankments, and 192 cuttings. The main works include the about 4 miles Colli Albani tunnel, crossing four different municipalities in Rome's province, and the 1 mile Volturno viaduct, with a 180 ft. metal span crossing Volturno river. In order to allow for flexibility of the System, the Project foresees four connections to the conventional Rome-Naples railway network, for a total amount of 13 miles. Furthermore, almost 44 miles of noise barriers and 87 miles of new roads have been provided. This is the Project in which the newly developed ERTMS Level 2 has been applied for the first time in Italy and in Europe: it would soon become an internationally widespread standard for HS Networks.

2.2 New Turin-Milan High-Speed/High Capacity Railway Line

Client:	Gruppo Ferrovie dello Stato Italiane (FSI Group)
Period:	1991-2006 (Turin-Novara Section) 1991-2009 (Novara-Milan Section)
Contract Value:	232.2 M€
Works Value:	€ 7.8 Billion

The new 187 mph, 78 miles line mainly develops in a plain area, and it has been characterized by much interference with existing roads, successfully overcome by providing new road overpasses or underpasses: almost all the existing road crossings have indeed been demolished and rebuilt. Environmental impact

has been minimized choosing an alignment that runs along one of Italian main highways (A4, Turin-Milan).

Three connections to the conventional railway network have been provided, in order to allow for flexibility of the System. The Project involves 285 Works, among which 21 viaducts and 25 artificial tunnels. The main works include the new 1 mile partly artificial and partly natural tunnel under the highway, and the 0.3 miles, 10 spans, steel and concrete viaduct over Ticino River.

2.3 New Milan-Bologna High-Speed/High Capacity Railway Line

Client:	Gruppo Ferrovie dello Stato Italiane (FSI Group)
Period:	1991-2008
Contract Value:	298 M€
Works Value:	€ 7.0 Billion

The new 187 mph, 113 miles line crosses the Po river valley, passing through two Regions, seven different Provinces, and 41 Municipalities.

Integration and interoperability with the existing conventional network entailed the creation of eight interconnections: they ensure the functional interchange between the networks, guarantee that fast passenger trains can stop and transition to the old line, and they will play a strategic role in upgrading freight transport.

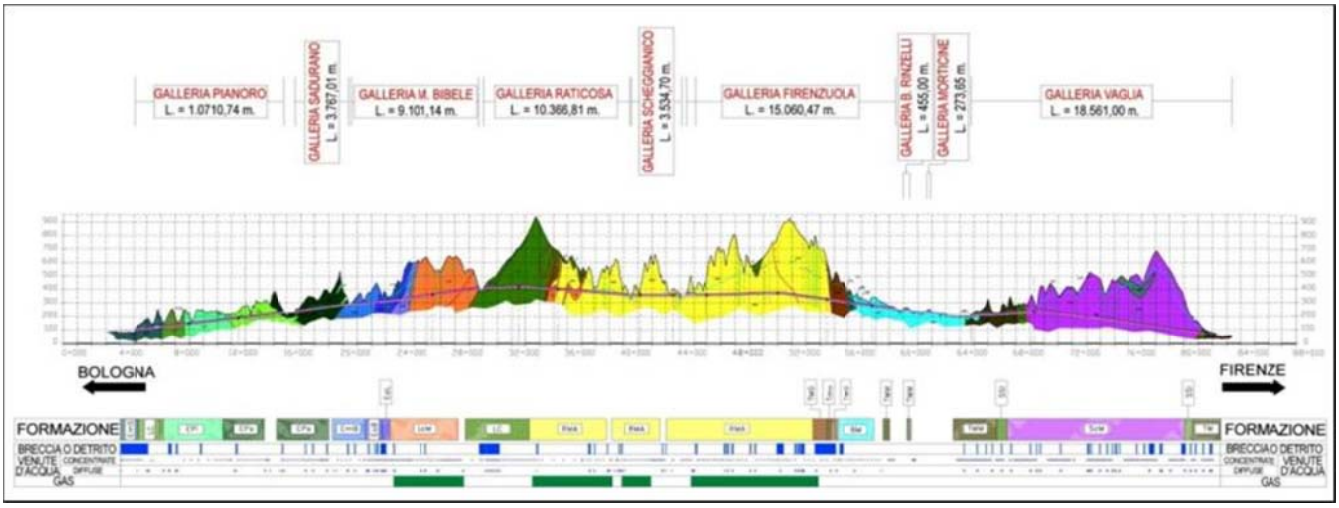
The main works include the new 450 yards two-pillars-suspended cable-stayed bridge over Po River. The three spans pre-cast concrete beam is characterized by its 630 feet free beam span bore by 72 steel cables. The two 57 yards tall suspending towers are grounded on two artificial islands of 1,200 sq. yards built on purpose. When put into operation the bridge, one of the longest in the world in its type, held the absolute record for cable-stayed High Speed/High Capacity Railway Bridges made of pre-stressed reinforced concrete.

In order to minimize the socio-environmental impact, wherever possible it runs parallel to existing Italian main Highway (A1, Milan-Rome). Furthermore, in Fontanellato municipality the Project provides about 1 mile artificial tunnel, at grade, covered with ground and greenery in order to provide landscape requalification; in Reggio Emilia municipality a new A1 highway junction has been provided (architectural design by arch. Santiago Calatrava) along with landscape requalification and areas set at new public greenery.

2.4 New Bologna-Florence High-Speed/High Capacity Railway Line

Client:	Gruppo Ferrovie dello Stato Italiane (FSI Group)
Period:	1991-2009
Contract Value:	177.8 M€
Works Value:	€ 5.9 Billion

The new 187 mph, 48.8 miles line involves two Regions and 12 Municipalities. Crossing both the rough Appenninian Ridge and preserved areas, over 93% of the line develops underground (over 45 miles of tunnels), and over 6% of the line is elevated (2.5 miles of viaducts and bridges). The Project comprises more than 500 different Works, among which nine different tunnels and six viaducts.



3. Project Approach

The Authority would like to know whether each Respondent is interested in the IOS-South scope, IOS-North scope, or both, as well as any recommendations for improvement to its delivery strategy. The EOI shall include a description of how the Respondent will approach each project scope and how each approach will meet the goals and objectives of the Authority and the hurdles to overcome to deliver the project(s) on time and on budget. This section of the EOI shall also include any innovative ideas for delivering both projects.

Italferr has been hugely impressed by the Authority's stimulating Project, and right from the start Italferr has been passionate about it. **Italferr's interest is therefore on both the Initial Operating Segments ("IOSs") as both will independently move the Project one step closer to becoming a reality for the Project's Stakeholders**.

The configuration of both Italy and the Italian High-Speed/High-Capacity Railway Network closely resemble the outline of California and its System, and Italferr is therefore in such a privileged position to be able to envision the main challenges such an outstanding Project is currently facing, and will face in the future. Italferr is thrilled by the opportunity to share with the Authority the experience gained, and to enable the Authority reach its goals.

To this extent, Italferr would approach the Authority's Project's scope bearing in mind the lessons learnt from its more than 30-years' experience.

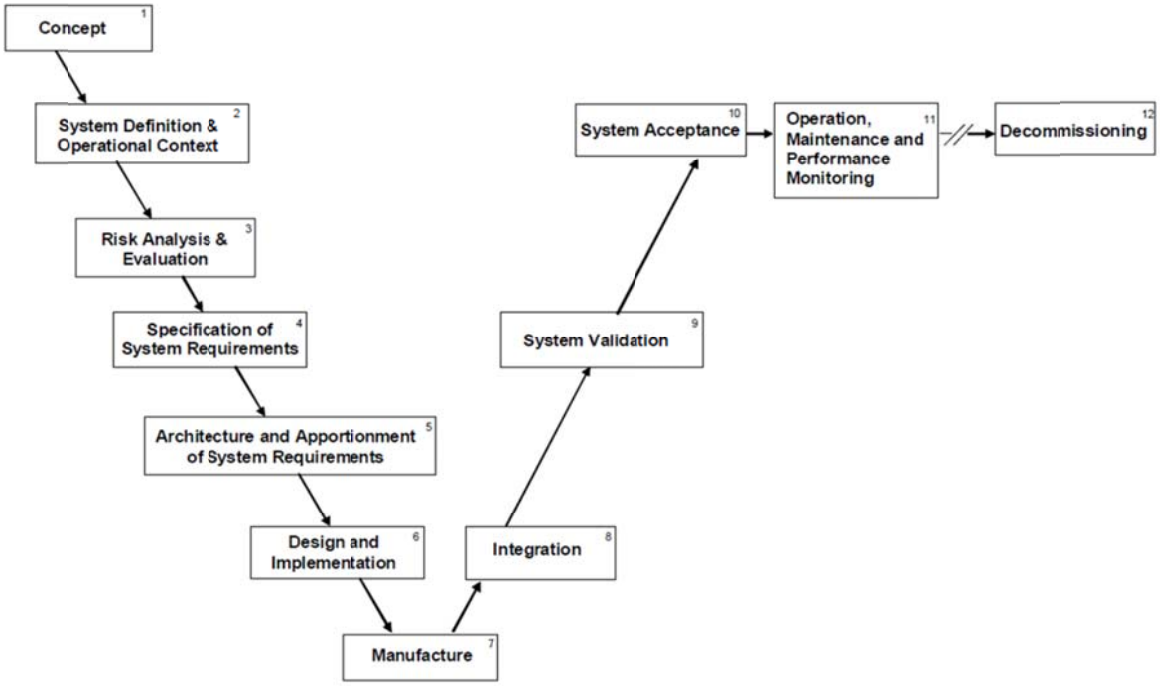
Italy is a rough country, scattered with archeological remains and heritage and stretched between the sea and the mountain ridges, with both environmentally protected beautiful natural areas and highly urbanized municipalities. In Italy may be found both well-developed, productive areas and underdeveloped ones. Italy has a very fragile natural eco-system, subject to seismic and hydrogeological conditions, floods and strong winds. In such a beautiful and delicate country mobility and environmental preservation have always been key issues, and often struggles. They are also seen as a mean to bring socio-environmentally sustainable development to more needing areas.

The Italian High-Speed/High-Capacity Railway Network Project – the most important and extensive public work to be tackled in Italy since the "Sixties" – did not aim merely to minimize the impact of such a huge new infrastructure, but it set itself the goal of improving the socio-environmental quality of the territory. Indeed, the new Network provided right from the start to be a decisive factor for leveraging the Italian Transport System, moving passengers and freight from road to rail and profiting both the quality of life and the environment. Not only the long distance passengers, but also the commuters, benefit from this: the first ones directly riding HS Trains, the latter gaining advantage since the Conventional Railway Network gets now relieved from part of its previous traffic.

The High-Speed/High-Capacity System also represented and still represents an enormous opportunity for the Country's economic development, increasing its productivity level and competitiveness. Being part of the main Trans European Network-Transportation (TEN-T) corridors, the new Network plays a fundamental role for developing the centrality, accessibility and integration of Italy and its economy in Europe.

Based on its experience, Italferr would share with the Authority the lessons learned, along with innovative ideas for delivering both IOSs. Italferr's experience in High-Speed Design and Construction Management would grant the pinpointing right from the earliest stages of the Project any risk factor, and to assess and select the best preventive or mitigating action, thus enabling the Authority to smoothly meet its goals within time and schedule.

Along with **Socio-Environmental Sustainability**, main emphases of Italferr's worldwide activity are **Safety and Quality**. Thus, Safety and Quality are the **first two key focus areas** that would lead Italferr's approach to the Project, enabling the Authority to meet its goals with the highest Safety and the upmost Quality and within budget and scheduled time. Italferr indeed believes **Safety and Quality are key Risk-Prevention tools** and focusing on them from the earliest Project stages up to all the further stages as Design, Construction, Testing, Commissioning, Operation and Maintenance, sets from the start a virtuous Project life-cycle that also grants the Project a smooth development and a timely and within-cost delivery.



Based on its experience, Italferr would strive to guarantee upmost Quality level along the **Project-Activities flow** (above schematized) and in all the Project phases. Developing and putting in place **Verification and Validation plans and procedures**, the coordinated flow of information between parties would be granted, giving additional focus to specific quality requirements for significant elements of the Project. The virtuous project cycle would be injected by the definition, right from the earliest design phases, of the more apt design choices, to be also locally selected and detailed according to the specific Works (i.e. aerial works, underground works), and worksites (i.e., constructability issues). **Further care would be put in place in proximity to potential sources of enhanced risks, i.e. other operating railway lines or main industrial activities**.

Safety in the course of Operations would be reached designing right from the start, and then procuring, putting in place, testing, commissioning and putting into operation, state-of-the-art proven technologies and systems.

For instance, the European Rail Traffic Management System/European Train Control System (ERTMS/ETCS Level 2) has been developed and first applied on the Italian Network and has now become an international standard for HS/HC Networks. ERTMS/ETCS Level 2 eliminates the possibility of human error and delivers the uppermost degree of safety at the highest speeds, also enabling a greater frequency of trains. Synthetically, ERTMS/ETCS Level 2 grants:

- operational and technical interoperability: an unified system allows a smooth opening of the market to different Train Operators, thus increasing the interest of service providers and their competition;
- performance, in that High-Speed Operations can be performed within the lowest amount of time interval between the High-Speed Trains;
- availability and Reliability: due to the innovative architecture of systems as ERTMS/ETCS Level 2, less equipment to be set along the line has to be procured, installed and maintained, thus reducing fault probability while at the same time improving system reliability;
- Safety: ERTMS/ETCS Level 2, its components and its implementation/put into operation is designed and produced in compliance with standardized rules, nowadays internationally set by European Cenelec norms.

At the same time, Italferr would approach the Project granting whenever possible the employment of standardized Systems. Standardized Systems will indeed enable both their interoperability and availability for long times to come, thus longing the life-cycle of the System. This will also greatly support the Authority to reach its goals within time and costs, in which off-the-shelf standardized Systems, being widespread among many different Suppliers incentivized to compete with each other, are usually readily available and at a lower cost.

Such a new infrastructure as the System the Authority is seeking to provide will enable the reorganization of the whole State transport system, satisfying the great demand in the large towns, providing new High-Speed Rail services, and at the same time leaving more room on conventional lines for commuter traffic or freight. Profiting from its previous experience, among the main focus with which Italferr would approach the Project's scope are the **Junctions between the new System and the existing Conventional Railway Network, the several different transport networks, the main Hubs** (i.e., main cities, ports, airports), **the maintenance facilities**. Accurately providing and optimally sizing these links in the key points, and at the same time strategically choosing and positioning the maintenance facilities, will enable the Authority meet its goals and objectives in setting a new incisive System, that would greatly benefit California and Californian Communities from a socio-environmental viewpoint, also improving the State overall mobility System.

The first specific areas of attention within the IOS-North would thus be the **junctions** in San José, Gilroy, Merced, Fresno, Kings-Tulare, Bakersfield, and the junction between the two branches of the IOS itself just south of Merced. Similarly, within the IOS-South they would be the junctions in Merced, Fresno, Kings-Tulare, Bakersfield, Palmdale, and Burbank. In both cases, particular care would be put

in the **junction between the two branches of the northern IOSs just south of Merced**. However, the same focus would be put towards each extra connection the design development should highlight the need of, and the connections to be provided with the maintenance facility network.

Even if San Francisco and Los Angeles junctions are not part of the IOSs, **Italferr would already keep such future connections in mind** in order to grant the most flexible system to be delivered, thus minimizing the risk of costly and time-consuming future adaptations to connect the IOSs with such key junctions. Experience has shown that the fluidity of traffic as a whole and the adaptability of the transport System towards future necessities largely depend on the efficiency of the connections and of the junctions.

Also, Italferr would approach the Project's scope greatly focusing on both the mainly **elevated or underground sections** of the IOSs. Italferr understands specific sections of the IOSs – as the Palmdale to Burbank section of the IOS-South – will require long High-Speed Railway **underground spans**. Other sections will conversely require long-elevated spans, with the necessity to design and deliver **non-standard structure in specific cases**, i.e. the intersection with other major transport networks (conventional railway line, highways) or natural occurrences (i.e., creeks).

Given the peculiarity of the Italian territory, Italferr has gained wide experience, as briefly synthetized in chapter 2, with non-standard High-Speed/High Capacity structures (i.e., Milano-Bologna Viaducts, Bridge over Po River) and long High-Speed/High Capacity Tunnels (i.e., the over 45 miles underground Bologna-Florence Section), in highly seismic zones and/or subject to strong winds, or flooding.

Therefore, Italferr knows these sections will require specific skills and experience in both designing and delivering the optimal key structural solutions that will be deemed to enable the Authority meet its goals and objectives in setting a new incisive System for the Californian State and Communities. To this extent, Italferr believes the socio-environmental sustainability of the Project is a key driver of the timely and within budget Project delivery.

Experience has taught such an outcome may be steered by a conscious approach, directly from the start, on the part of all the players in the scenario, among which of course, designers and contractors. For example, even if stations are not part of the IOSs scope of work, **Italferr would focus on the design and/or the development of the IOSs already bearing in mind said passengers facilities**, and the main socio and urban developments they entail, comprehensive of the needs of their surrounding Communities. Furthermore, the smooth Project's socio-environmentally assimilation may be pursued, in the case of the stations, by profiting from this great opportunity specifically seeking the urban continuity between areas among which the railway line will pass. Instead of being divided by the new Line, these areas could actually greatly profit from it.

Benefiting from its previous experience, among the main emphasis with which Italferr would grant the Project's socio-environmental sustainability are:

- full integration with the Californian transport network and the existing railways
- improved quality and quantity of passenger and freight services over long and short distances
- improved transport services in metropolitan areas and upgrading of stations
- the highest architectural and engineering quality of the works
- the best assimilation into the environment and the territory
- protection of heritage

Italferr would approach with extra care the **socio-environmental sustainability** of the Project in all its phases, also taking into consideration the heritage and archaeological context. Constant connections with the Authority and the Stakeholders, among whom Public Authorities and Communities, would grant to meet the goals and objectives of the Authority and to assess and to overcome, right from the start any issue or risk factor that might arise.

Italferr would carefully add to each Project phase preventive measures apt to preserve and to enhance the socio-environment in which the Project is located. Among those that may greatly improve the socio-environmental assimilation of the Project:

- the definition, right from the design phases, and the implementation of specific Health, Safety and Environment plans and procedures
- as above said, the setting and implementation, right from the earliest stages of the Project, of a comprehensive Project life-cycle, based on Safety and Quality
- the enhancement of the crossed towns and of the related transport networks, with the upgrade of degraded or undeveloped areas, if any, and the creation, among other things, of open spaces and green areas
- the natural coverage of embankments or retaining walls where the case
- the realization of iconic High-Speed Structures (i.e., bridges, viaducts, tunnel approaches, stations) where the case
- the construction of alternative roads in order to reduce the impact of the traffic generated by the construction site vehicles
- the socio-environmental rehabilitation of areas used as construction sites or for other temporary works
- the put in place of noise barriers and vibration-control measures (i.e. the right thickness of ballast or noise-absorption mats)
- the reduction of the impact of the electric power supply and the generated electromagnetic fields
- the curbing of emissions in the course of the construction by means of measures apt to reduce all the contaminating aspects, as noise, vibrations, pollutants (i.e. dirty waters, or dust). Among said measures, the asphalting of the site yards, the implemenation of barriers, the constant monitoring of the emissions in air, water and soil of noise, vibrations, pollutants, and the constant assessment of the social perceptions on the surrounding Communities
- the reuse within the Project of the soil extracted from the construction excavations (i.e. grounding, tunneling): according to their kind and quality, these soils can be reused within the construction as concrete or ballast, or for the landscaping of needing areas
- the adoption of measures apt to minimize water consumption, as design choices to be evaluated locally and specifically, and the definition and put in places of specific procedures and codes of practices to be put in place in the course of construction. These measures would be complemented by the mitigation of the hydrogeological impact of the construction phases by means of the improvement of banks/channels and waterways, and the creation of alternative wells and pipelines
- the protection, preservation and enhancement of the heritage or archaeological assets, including the setting up of display facilities and the carrying out of digs for research purposes.

Experience teaches than that it will then be crucial **to select designers, contractors, providers, suppliers and Construction Managers with sound High-Speed Rail and proven technologies**

experience. Simultaneously, **final design, testing, commissioning and put into operation will have to be entrusted to engineering firms with the upmost capabilities and experience in the specific field**.

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Furthermore, as the Authority has pointed out, High-Speed Systems **involve a complex reality comprising many various and different aspects** such as infrastructure, rolling stock, operations, maintenance, along with **cross-sector issues like financing, commercializing, managing, and training**.

As well as improving rail services, promoting a modern image, and yielding greater customer satisfaction, High-Speed Systems play a key role in achieving territory integration and in helping to create socio-economically leveraged Communities. Along with sound technical and managerial competences and skills, factors that are world-wide emerging as fundamental success-drivers of High-Speed System implementation are

- the involvement of the State and of the Public Authorities
- the steadfast and cooperative involvement right from the start of the various Stakeholders, among which the Communities and the main Socio-economical Players
- the involvement of the Private Sector
- the size and specificity of the Project, along with the pursue of socio-environmental customized solutions
- the flexibility of the System towards future needs
- the adopted procurement and delivery methods
- the Interface and Integration Management, within the different Packages of the Project and within its various disciplines as further discussed in the oncoming paragraphs
- Project Financing

When it comes to Project Financing, the lessons learned from the different world experiences show how the preeminent Project's success-driver appears to be the **correct approach of the business model in terms of financial contribution by the Governmental and Public Authorities**. It is rare that the high construction costs normally involved in these kind of Projects are sustainable by the private sector, even when future Operation is granted on a concession basis and a high level of ridership is expected. **Italferr feels the industry will positively recognize the ability of the Authority to having already managed to secure sources of funding for capital costs for the Program, and having furthermore already forged partnerships to invest in funds for connectivity Projects**. Italferr anticipates **the Industry will also positively recognize the fact the Authority has declared itself set to continuously improve the rigor and reliability of its modeling and estimating tools and to unremittingly try to identify further ways to secure additional public funding as the implementation of the System moves on**.

4. Responses to Questions

4.1 Commercial Questions

1. *Is the delivery strategy (i.e., combining civil works, track, traction power, and infrastructure) likely to yield innovation that will minimize whole-life costs and accelerate schedule? If so, please describe how. If not, please recommend changes to the delivery strategy and describe how those changes will better maximize innovation and minimize whole-life costs and schedule.*

As will be further discussed also in the answers provided to the subsequent questions, the delivery strategy the Authority outlined for implementing both the IOS-North scope and the IOS-South scope, i.e. combining different disciplines on wide spans of the Network as a whole IOS, allows enlightening the benefits of an all-inclusive view for the implementation of High-Speed System.

The Italian High-Speed/High-Capacity Railway Network has been designed, managed, and delivered with such a **holistic view**. The profits of such a comprehensive approach, already showing in the course of the construction phases, are now even more self-evident in its current management, operation and maintenance phases, as well as in the ease with which further sections are presently added to the Network.

Constantly, engineering and technology moves on. The wide spreading of systems and solutions allow for a wide knowledge and experience to be gathered, thus granting the possibility, for every new Project, to benefit from the previous ones, saving time and costs enabling to point right from the start towards an already tested solution.

Constant innovation plays a key role in achieving the best solution for the whole System and for each specific Work and aspect within the System. Innovation will allow achieving the optimal cost-benefit, the longest life-cycle, and the maximum flexibility in the System, thus granting a System apt to front future needs for long time to come.

But innovation is not solely achieved by a particular delivery strategy, not even a comprehensive one as the one foreseen by the Authority in this RFEOI.

Generally, the industry tends to consider the conditions set by the Contracting Authorities adopting technological solutions that meet the requirements set from the beginning by the Client, but also – and in particular - that optimize costs, efforts.

While it is certain that an holistic procurement approach will lead to up-to-speed implementation and minor risks of management disruptions of Contractors (as it will be better described in the following points), **a likely high degree of innovation will be achieved only if a well-defined and advanced set of standards will be set** from the beginning in the future RFP for the Delivery of the IOS.

These will allow a fair competition between different suppliers and – also – will make it possible to produce important economies, due to the use of common standards known by the industry actors in their respective fields. This is also why the Authority, to finally get innovation in the whole project cycle, will need to carefully select (in case assisted by proper consultants) the technology providers, based on their level of experience.

At the same time, though, **if occurred inconsistently**, innovation is likely to have a **negative impact** on the whole System and its reliability, and on its life-costs. Therefore, innovation has to be carefully designed and woven into the design and more in general into the System, with a careful Integration and Interface Management.

Italferr would approach the Project whenever possible using the employment of **state-of-the-art standardized Systems**, thus providing both interoperability and availability and the longest life-cycle. Also, as said, being widespread among many different Suppliers, off-the-shelf standardized Systems are **usually readily available and at a lower cost**. Italferr's experience in High-Speed Design, Value Engineering and Construction Management would enable the Authority to replicate an Operating System, designed and managed with a comprehensive vision, thus **starting from an already tested substantial innovation and moving forward from it**, looking every time for the optimal specific solution, while at the same time avoiding inconsistency and unreliability.

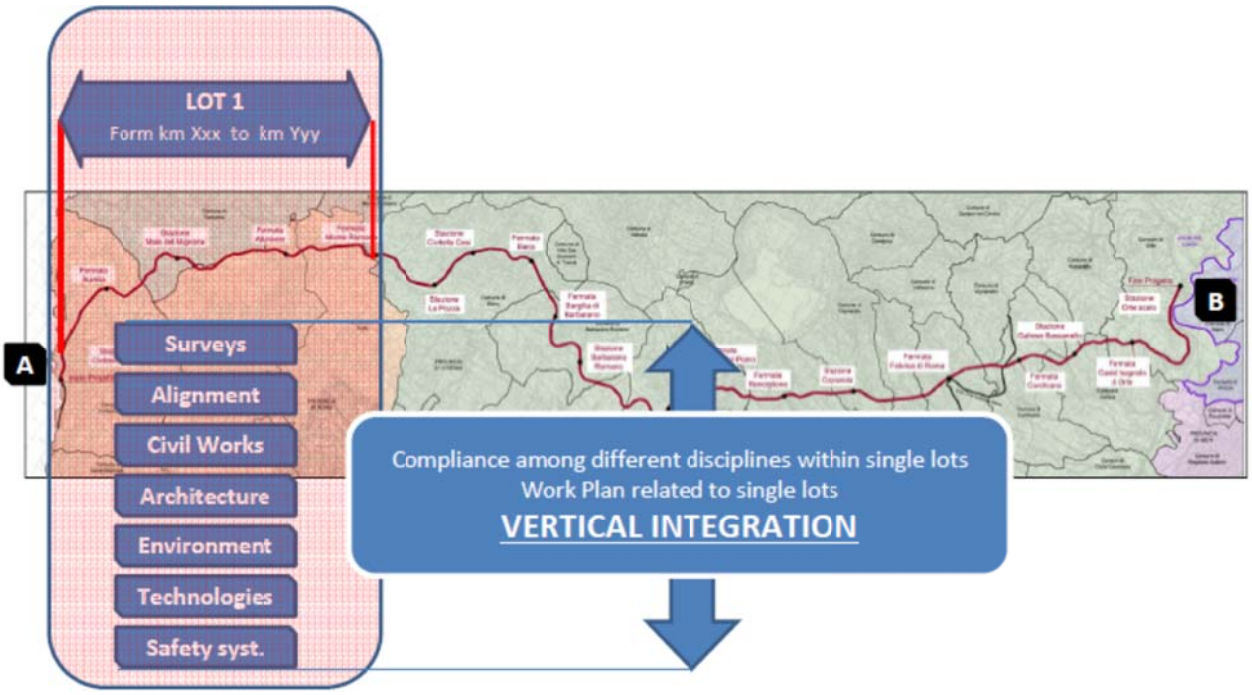
2. *Does the delivery strategy adequately transfer the integration and interface risks associated with delivering and operating a High-Speed rail system? What are the key risks that will be borne by the State if such risk transfer is not affected? What are the key risks that are most appropriate to transfer to the private sector?*

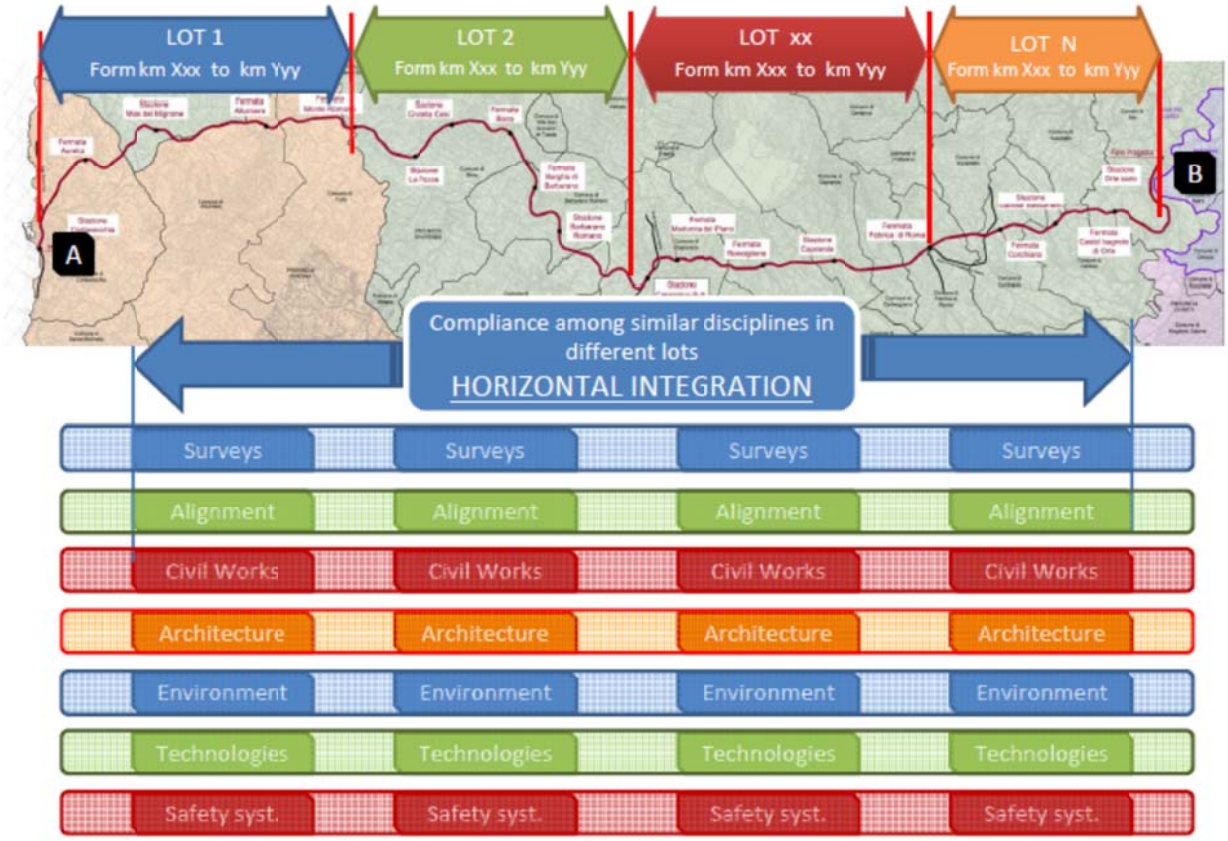
A Project life-cycle may be approached with a System Decomposition - of a System Integration-oriented methodology. System Decomposition is a worldwide accepted procedure in System Engineering by which a complex Project or system is repetitively subdivided into smaller, better manageable parts until an acceptable level of complexity is accomplished. Usually, the Horizontal Decomposition is essentially geographical, while the Vertical Decomposition may be chiefly technical and related to the level of complexity of the Project System. Conversely, System Integration includes the integration and the assembly of the various components, subsystems, systems and procurement packages that lead to the Project delivery.

Experience shows **System Integration as a key driver in the successful delivery**, within time and costs, of such challenging Projects as the IOSs.

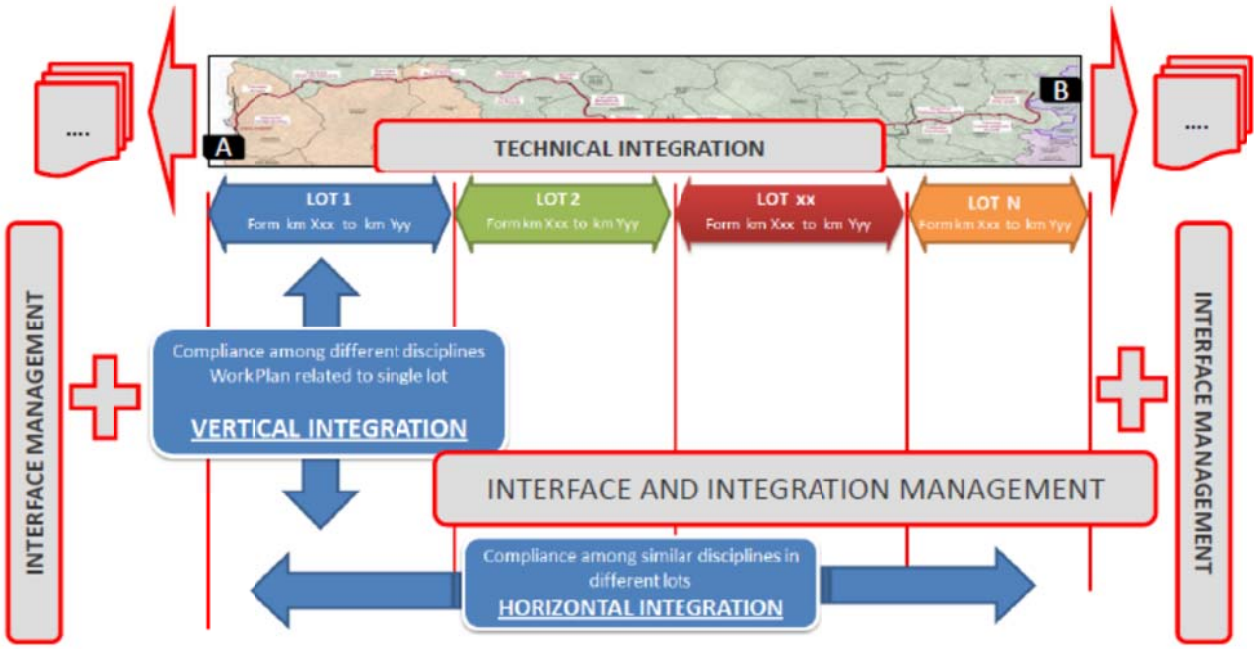
While granting the achievement of a smoothly running System, **System Integration will minimize the risk of overlooking at interface or integration issues**, of costly and time-consuming re-performing of activities. The main drivers of System Integration may be pinpointed in **Interface Management and in Vertical and Horizontal Integration**. Interface Management should be performed right from the earliest design stages and up to the whole Project life-cycle, through Construction, Testing and Commissioning, Put in Operation, Operations and Maintenance. For a successful performance, experience shows Process Governance and Management to be critical success factors, enabling to set right from the start well defined frameworks.

Vertical and Horizontal Integration are synthetized by the following schemes. Typically, Vertical Integration is needed to assure the entire different Project's component (i.e., alignment, civil works, technologies and systems,) appropriately concur to deliver a performing Project. Horizontal Integration is instead required to assure the several Projects' Phases (i.e., different construction packages) are suited to together deliver the performing Project.





A holistic view as the one granted by a successfully performed Interface and Integration Management will enable the Authority successfully reach its goals.



Of course, in the case of complex and comprehensive Projects as the IOSs, **several delivery strategies might be implemented**. Experience shows that, among the possible different procurement and contractual scenarios, for each Section of the line, one Contractor for civil works/tracks and another one for technologies may be entailed. This will lead to both Contractors not having direct responsibility for both the Vertical Integration within each segment, and the Horizontal Integration between the different segments.

Instead, as actually foreseen by the Authority, **a single big Contractor for both civil works/tracks and technologies, or a single Contractor for civil works/tracks in charge of a sub-Contractor for technologies, may be awarded**. This will still lead to the Contractor not having direct responsibility for horizontal integration between segments, but the Contractor will be responsible for Vertical Integration, thus reducing Interface and Integration Risks.

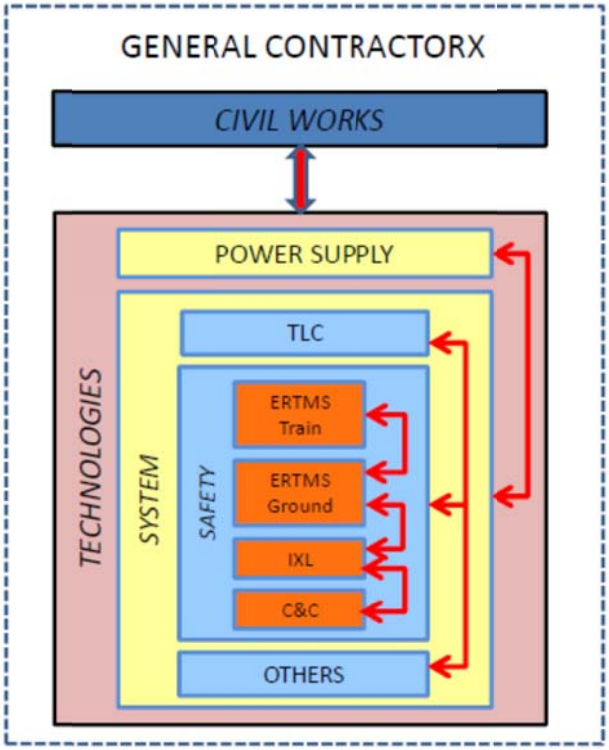
Indeed, Civil Works Integration Risks are usually physical parameters well defined by standards and good design is the key driver for a smooth Integration Management. Experience shows Horizontal Integration riskiness level increases when it comes to technologies. As a matter of fact, **foreseeing several technologies Contractors/Providers may lead to critical issues**, schematized in the following points.

- Several different Proprietary Communication protocols: to overcome this criticality it would be advisable that the Authority request from each Contractor that they provide proprietary protocol, in order for the other Contractors to be have compatibility with their next segments. This could however entail costly and time-consuming modification activities on the different protocols, and even on those installed in the already Operating sections, along with the need to provide within the Project an ad hoc Integration Testing Laboratory for which each Contractor will have to be asked to supply a complete set of equipment to be tested.
- Standardized Communication protocols but no Inter-Operability Test (IOT) performed: even with a fully standardized protocol, it would be quite impossible to reach fully compatibility between different Suppliers. To overcome this criticality it would be advisable the Authority foresaw the performance of IOT Tests in the Integration Testing Laboratory, on equipment specifically supplied by the Suppliers. The IOT Test will be aimed at tuning the differently supplied Systems, and once the interface is stable enough a Final IOT will be performed on site, using operating equipment.
- Different Suppliers releases: Usually each Supplier has its own approach to new releases/upgrading, i.e. number of releases per year. It could therefore happen that new functionalities are implemented in different moment, generating misalignment between the different Sections of the line. To mitigate this risk, the most updated Supplier might have to delay the implementation of its own new release, though thus delaying the upgrading of the segment.
- Impossibility of performing IOTs on operating sub-systems. Indeed, IOT are usually heavy processes where tests are to be performed not only in normal functioning model, but also in (mock) degraded modes. The IOT results will then have to be analyzed, and the outcome might entail modifications to be performed on the installed software and hardware, till the achievement of the complete interoperability between the different Systems supplied. This is a time-consuming and costly process, even more in the case of systems already in operation, where – in order not to

interfere with the Operations of the line, the tests have to be performed as much as possible in the dedicated Laboratory and only a minimum set on site, requiring the line to be put out of operation.

- Disagreement between contractors about the analysis of IOTs results may arise. In this case, it would be advisable the Authority create **a supervisory System Integrator with both technical competence and experience and acting on behalf of the Authority**.

The Integration risk might be reduced foreseeing a Contractor for civil works/tracks for each Section, but at the same time a single Contractor for the whole line for technologies.



This would grant technological horizontal integration, even though still the Contractors would not have direct responsibility for vertical integration within each segment, and for horizontal integration between segments in the case of the civil works/tracks.

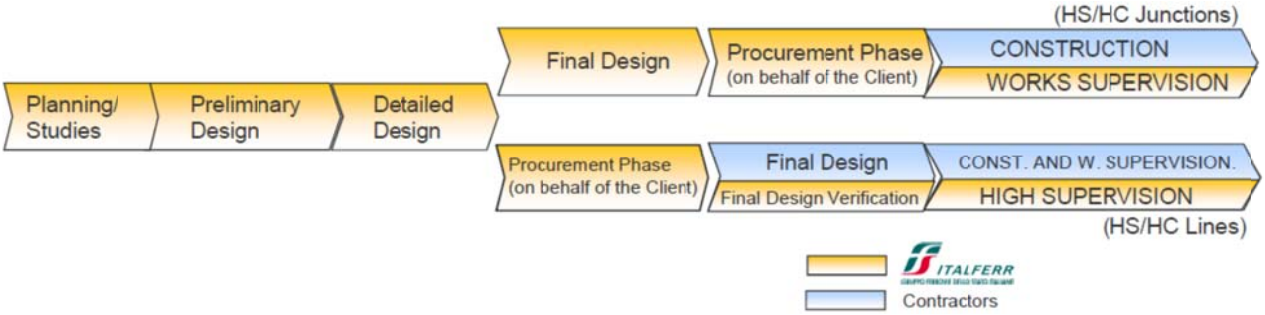
Indeed, foreseeing **a Contractor for civil works/tracks for each Section, and a unique sub-Contractor for technologies for the whole line, would further minimize any Vertical Integration risk and technological Horizontal Integration risk**, leading to Contractors having not direct responsibility only with regards to the horizontal integration between segments for the sole civil works/tracks scope of work.

However, in any of the above mentioned scenarios it would be advisable **the Authority entailed a Third Party with Integration Supervision - System Assurance/System Integration Management**. Carried along all the Project phases, these activities would have a deeper focus on testing, commissioning and put into operation, thus minimizing even any residual risk in the delivery scheme.

The experience gained so far shows integration within existing Systems (i.e. connections with conventional railway networks, railway junctions, and railway hubs) has to be strictly managed and supervised, and it is usually advisable to foresee a **Third Party Responsibility**, other than the Contractor.

This also because these activities imply intervention on existing systems, by definition then not made by the Contractor within the scope of its services, and upon which the Contractor might not be comprehensibly able to accept responsibility. In case of interfaces/interferences with other Systems it would also be advisable that the Authority carefully outlined in detail the scope of work of the Contractor. The Third Party, entailed with Integration Supervision and System Assurance/System Integration Management, would also greatly support the Authority to deliver the System within time and costs, carefully planning and checking the schedule of the interventions needed on the various different Systems, taking into account both the schedule of the different Suppliers/Contractors and of the Operation of the different Systems.

The experience gained so far and the comparison now possible among different delivery approaches show that the stricter the overseeing, the higher the whole-life cost savings and the lesser the risk of costly time-delays. Actually indeed, in the most critical sections of the Italian Network, as the urban junctions and the connections between the HS/HC Network and the Conventional one, Italferr has performed also Final Design.



Such a whole and consistent approach grants the achievement of the sought-after minimization of Project's life-costs and the meeting of the goals and objectives of the Authority on time and on budget.

The delivery strategy outlined by the Authority, combining different disciplines on wide spans of the Network as the IOSs, **actively transfers to the designers, the contractors, the operators the bulk of the integration and interface risks associated with delivering and operating and High-Speed Rail System**.

Regarding the residual risks borne by the State, our experience shows that

- One of the main risks to be considered is the possible **lack of full integration and understanding of the System within the Stakeholders**, among whom primarily the involved Communities. This risk can be minimized through a relentless and caring relationship within the Communities, right from the earliest design stages. It definitely is worthy the Authority, as stated in its 2014 Business Plan, has committed to more openness and transparency and to improving relationships with the Communities, to the extent of establishing partnerships with them for building the Project and of entering into major agreements to preserve important farmlands and to mitigate the effects of the construction on agricultural operations. The Authority's commitment, reaffirmed in its 2014 Business Plan, to continue to work with local government entities to develop station area plans around the future High-Speed rail stations will surely improve the integration of the System within the Communities, as will do the Authority's decision to back, in partnership with FRA, station cities in the development of station area plans consistent with and supportive of local and regional planning efforts.
- Another main risk that largely affects the State, even with a delivery strategy meant to transfer to the private sector the bulk of the responsibility for infrastructure long-term maintenance, **is the risk of infrastructure shortfall or fast obsolescence**. This risk cannot actually be minimized so easily.

3. *Are there any other components of a High-Speed rail system that should be included in the scope of work for each project (e.g., rolling stock, train operations, stations)? If so, how will this help meet the Authority's objectives as stated in this RFEI?*

The combining of different disciplines on wide spans of the Network as the IOSs grants the Authority to profit in the delivery of the IOSs from the benefits of an all-inclusive view. To this extent, the broader the knowledge of the whole System, the better. It would then be advisable the Authority, maybe along with engineering consulting services experienced in the High-Speed field, developed and assessed in-depth studies about the infrastructure and the systems to be provided within the whole System, with a broader vision than the IOSs' scope.

The studies should focus on main infrastructural issues key to the successful achievement of an effective High-Speed System, as the connections with other Transport Systems and junctions, the stations and the maintenance facilities, the optimal alignment and its characteristic structures (i.e., elevated or underground).

Both the infrastructural and technological issues indeed entail socio-environmental traits, and the set of all these features is relevant to be envisioned as a whole in the entire System, in order to minimize the risk involved in the obvious initial delivery of a part of it, as the IOSs. Along with this extensive infrastructural knowledge, the studies should focus on main technological issues, as the signaling and control and the power systems. The power system entails the design and the construction of high tension lines and of sub-stations.

The Authority could also evaluate the opportunity to insert, within the scope of works of a single IOS, the option to extend – for the technologies and systems at least – the scope to cover both the IOSs. This would minimize the Interface/Integration Risks outlined in the previous paragraphs, and improve the System with regards to its Safety Assurance activities, thus reducing the time and the costs needed to successfully deliver it.

It would be also advisable the scope of work would be strictly outlined and carefully detailed, especially in relation to systems and technologies: i.e., among the several Inter-Operability Test (IOT) to be performed, while some (train-track interaction, train-power line interaction, …) will more deeply pertain to the rolling stock supplier, **others (i.e. the interaction between on-ground and on-board ERTMS sub-systems) will have to be performed also by the provider of the on-ground systems, and it would be advisable activities as this one were already specified within the scope of work right from the start, not to become otherwise costly addenda later on**.

Also for Inter-Operability Test (IOT), it would be advisable to entail a **Third Party** with responsibility for **cross-acceptance safety issues** such as the ones above mentioned.

4. *What is the appropriate contract term for the potential DBFM contract? Will extending or reducing the contract term allow for more appropriate sharing of risk with the private sector? If the Respondent recommends a different delivery model, what would be the appropriate term for that/those contract(s)?*

We understand this question to be related to the extension of the financing/operations part of the delivery system envisioned by the Authority, and as an engineering consulting company – that is, not being a Financial Player – we deem Italferr's answer to this question would not give the Authority the meaningful value Italferr's aims to express. Therefore, we rather not answer it, in order not to influence the Authority with a vision that cannot be a real expression of the specific Industry's vision.

5. *What is the appropriate contract size for this type of contract? What are the advantages and disadvantages of procuring a contract of this size and magnitude? Do you think that both project scopes should be combined into a single DBFM contract?*

Among the main advantages that can be envisioned in the delivery strategy the Authority outlined for implementing both the IOS-North scope and the IOS-South scope, i.e. combining different disciplines on wide spans of the Network as the IOSs, **is the benefit of an all-inclusive view for the implementation of High-Speed System, thus minimizing the interface and integration risks.**

Another benefit comes to the attractiveness of such a delivery Package for both the Public Sector and the State, providing a steady and consistent flux of activities. The careful managing on the part of the Authority, along with engineering consulting services experienced in the High-Speed field, will assure the smooth and timely delivery of the contract, minimizing the Project's life-time cost and the involved risks.

Of course, since this delivery strategy **entails less different procurements, the risk involved in the few ones increases**. It would be advisable the Authority, maybe along with engineering consulting services experienced in the High-Speed field, carefully planned, developed and oversaw the procurement phases, assuring **only High-Speed highly experienced Designers and Contractors accessed the last phases of the procurement**. Carefully sizing the scope of work in order to make it large enough to be attractive to the strongest and skilled players, while at the same time not too big to discourage but a very few of them, would minimize the risk involved in the procurement.

However, given the technical and managerial complexity inherent such an articulate delivery, and since the delivery comprehensive approach leads to an optimization of the Project's whole-life costs and eases the cost-control within the single delivery phases, It could be advisable the chosen Designers and Contractors to be those with the strongest and proven technical capabilities, in order to grant their ability in an sound and time and cost-effective delivery.

In order to get the optimal equilibrium between a holistic vision and the comprehensible opportunity of a timely delivery of an operational IOS, the current IOS strategy would appear fair, i.e. to provide only one of the IOSs in the first contract. This would indeed constitute a good balance, and it would even more be advisable the Authority, along with engineering consulting services experienced in the High-Speed field, developed and assessed in-depth studies about the whole infrastructure and the systems to be provided within the whole System, further than the IOS's borders. The IOS size could be the balance between the different possibilities, with the captions enlightened in the previous paragraphs, and here below synthetized:

- It would be advisable the Authority evaluated the opportunity of a **more specific procurement/delivery method for the most critical sections of the System**, i.e. the **urban junctions**, the **connections between the HS/HC Network and the Conventional one**, the **chiefly underground sections**. As stated, this has been the approach used, as an example, on the Italian High-Speed/High Capacity Railway Network, in which as stated in the previous paragraph Italferr has developed, supervised and managed on behalf of Gruppo Ferrovie dello Stato Italiane (FSI Group) the entire Network Design and Works Cycle, and in the most critical sections of the Network Italferr has performed also Final Design.
- When it comes to technologies and systems it would be advisable the Authority evaluated the opportunity of foreseeing right from the start t**he possibility of a later addition to the scope of work, apt to cover the whole IOSs span**. Other activities, as the System Integration/System Assurance, could be conveyed through **separate delivery strategies** in order to grant the benefit in terms of risk reduction and time- and cost-savings previously enlightened.

This approach has proved to grant a timely delivery of the Projects, with the utmost quality, at the same time minimizing their life-costs.

Finally, one point, in our vision, still needs to be evaluated properly since it does not appear very clear that is how to include – in the responsibilities of the future Developer of the IOS - also the segments already built, i.e. Contract Packages 1, 2-3 and 4.

6. Does the scope of work for each project expand or limit the teaming capabilities? Does it increase or reduce competition?

The international experience gained on High-Speed Rail Networks shows the extension of both the IOS-South and IOS-North scope appear surely vast but still feasible for a complete and sound Contractor Team.

Even though the Industry's might wait the actual procurement phase to respond, such a challenging and passionate Project is bound to create a thrill in the main competitors, expanding their teaming efforts in order to get the best players on board. The successful delivery of the IOSs and the meeting of the goals and objectives of the Authority will indeed largely depend on the choosing of the best Professionals, with the right skills and experience and, above all, passion and commitment.

It would be advisable the Authority **set aside at least a six months' time** for the development of the offer on the Prospect Contractor's side, since in the course of such a tender potential respondents are to study in detail the technical documents made available and to develop a complete design, aimed at an in-depth evaluation of the bill of quantities of the project and the relevant costs, in order to develop a sound and consistent technical and financial proposal.

Taking into account the efforts that Prospect Contractors will put in place in order to respond to the procurement, a **minimum stipend would enlarge the attractiveness of the tender**. Indeed, experience shows that the participation to tenders of size as the IOS's one, a consistent development of resources with different expertise has to be deployed, with full commitment.

In this context, a more specific procurement/delivery method for **the most critical sections of the System**, i.e. the **urban junctions**, the **connections between the HS/HC Network and the Conventional one**, and the **chiefly underground sections**, could further steer competition, encouraging competitors to take part also to the procurement processes that best suit their particular skills, and to team with other prospects where in order to get the best suit of competencies as needed by the specific tender.

Approaching the Project as Italferr would do, foreseeing whenever possible state-of-the-art standardized Systems, would grant the System both interoperability and availability, and the longest life-cycle. Also, as said, being widespread among many different Suppliers, off-the-shelf standardized Systems are usually readily available and at a lower cost, and the request of these kind of system is bound to greatly foster competition among the several different providers. On the contrary, a delivery strategy that led to several different Proprietary Communication protocols could reduce competition, and lead to an increase in costs, since the single provider wouldn't be incentivized to compete in that being the sole provider. Also other costs, as upgrading or maintenance ones would increase, due to the necessity of sorting to that specific provider.

4.2 Funding and Financing Questions

7. *Given the delivery approach and available funding sources, do you foresee any issues with raising the necessary financing to fund the IOS-South project scope? IOS-North project scope? Both? What are the limiting factors to the amount of financing that could be raised?*

As above high-lightened, the different world experiences demonstrate that the approach in terms of **financial contribution by the Governmental and Public Authorities appears to be a leading success-driver**, and it is very good the Authority has already managed to grant three sources of funding for capital costs for the Program. Rarely indeed the high construction costs normally involved in these kind of Projects is sustainable by the private sector, even when future Operation is granted on a concession basis and a high level of ridership is expected. Truly, experience has shown operating revenues can cover the operating costs and, maybe, the purchase of the rolling stock/its maintenance, and it is reasonable the Authority is expecting that costs incurred during the operating period, such as operating and maintenance costs should be funded using operating revenues.

It is indeed proven that, as the Authority states in its 2014 Business Plan, ancillary revenue sources are an important revenue component of most international High-Speed Systems, including various combinations of commercial development and real estate, parking, services, communications and third party use of right-of-way, advertising and sponsorship.

Passengers' stations in metropolitan areas or in areas under development will attract further Private investments and development, possibly within the Authorities facilities themselves (i.e., stores and facilities within the stations) and Operated by the Contractor, thus increasing both the funding availability for the Project, and the Operation Revenues. However, it would certainly be advisable for the Authority, in order to deliver both the IOSs and the whole System, to go on pursuing public funds for the construction and the maintenance of the infrastructure.

8. *What changes, if any, would you recommend be made to the existing funding sources? What impact would these changes have on raising financing?*

As above stated, not being Italferr a Financial Partner, we deem Italferr's answer to this question would not give the Authority the meaningful value Italferr aims to express. Rather we suggest that the financial solution be subjected to serious study by relevant financial experts and government finance agencies such as the California Industrial Bond Authority.

9. *Given the delivery approach and available funding sources, is an availability payment mechanism appropriate? Could financing be raised based on future revenue and ridership (i.e., a revenue concession)? Would a revenue concession delivery strategy better achieve the Authority's objectives?*

As above stated, not being Italferr a Financial Player nor a Railway Operator, we deem Italferr's answer to this question would not give the Authority the comprehensive value Italferr's aims to express.

However, it is worth noting that the earliest High-Speed Railway Section deployed in Europe (1978) has been the so-called Italian "Direttissima", the 158 miles Florence-Rome high-speed railway. Since then, on behalf of Gruppo Ferrovie dello Stato Italiane, Italferr has gone on delivering the various sections and phases of the Italian High-Speed/High-Capacity Railway Network (which entailed also the upgrading to the utmost technologies and safety facilities of the at that point dated Florence-Rome section). Naturally, then, the delivery had to be developed and managed by Italferr in close contact and synergy with the network Operators (it is indeed renown the Italian HS/HC Network has been the first one to open to multiple Operators).

Based on our experience in developing the Italian High-Speed/High-Capacity Railway Network in close relationship with the Operators, we confirm the Authority's understanding the ability to attract riders will ultimately drive both the High-Speed System's financial performance and its environmental benefits, and we deem reliable and sound ridership forecasts become key in the outlined Private-participating funding scheme. Indeed, said forecasts are the grounds on which potential respondents may plan a consistent and thorough business model.

It is therefore favorable the Authority has continued to refine, improve and update its ridership and revenue forecasts, incorporating in the 2014 Business Plan new and re-analyzed data and reflecting a range of potential outcomes, as well as to review its Operation and Maintenance cost forecasts. As the delivery of the System moves on, it would be advisable the Authority, maybe along with engineering consulting services experienced in the High-Speed field, continued to provide to the respondents **updated in-depth Operation and Ridership Forecasts studies**. It would be advisable they were broadened to comprehend operation and maintenance facilities and schemes.

4.3 Technical Questions

10. *Based on the Authority's capital, operating, and lifecycle costs from its 2014 Business Plan, describe how the preferred delivery model could reduce costs, schedule, or both. Please provide examples, where possible, of analogous projects and their cost and/or schedule savings from such delivery models.*

In a railway infrastructural Project, worldwide experience shows that typically, the Project Investment whole-life costs rise with each ongoing phase of the Project itself. Not only experience displays this occurrence to be constant through the years and the different locations: it shows the trend increases in recent times, notwithstanding the better tools nowadays available. One of the major risks enlightened by our experience is therefore an **original undervaluation of the Project**.

Indeed, the Authority's 2014 Business Plan updated capital and lifecycle Costs estimates constitute a strong milestone towards the restraint of such a risk. This risk may be further managed and even mitigated by applying, right from the start of the Project, the most accurate Design and Design Evaluation, according to each Design Phase. **The Design will have to take into account the whole**

System, in order not to overlook any possible interference, requirement, interface, or item that would then become (costly) needed in a further Phase. Also, the most accurate estimates of the indirect costs, hindrances, and Project investment value are to be performed right from the start. In both cases, **skill and experience are key success factors**, and the support right from the start of the appropriate skilled and experienced Engineering Consultants becomes a very valuable asset to the Client.

Project's choices and requirements are driven by in-force Laws, Specifications (i.e. ITS) and Best Practices, but may also vary in function of more specific Client's Requirements and Design Options.

The main technical drivers that right from the start highly impact the Project may be pinpointed in the choices made about both the infrastructural and technological solutions to be adopted within the Project and in the Stakeholders' and Environmental Management. The choice about the Infrastructural Solutions to be adopted sets the Project's elasticity towards future developments and thus its Life-Span and its Value.

For instance, main cost-driver choices that have been made in the Italian HS/HC Network on functional and/or on safety grounds, may be pinpointed as follows:

- **Network apt to both the Passenger and Freight use**: This allows an increased flexibility of the System and a wider possibility of its future growth, thus ensuring a longer Life-Span of the System and – of course – of the consequent socio-economic benefits the Nation gets. The choice deeply impacts the infrastructures from the start, leading to structures that need to be able to equilibrate freight higher dynamic loads, while at the same time guaranteeing the upmost passengers comfort, under all operating conditions.

- **Increased track spacing in comparison to lower speed railway networks**: This choice takes into account dynamic effects and, as per ITS Specifications, depends on factors as design gauge and speed. It leads to a wider railway substructure, i.e., wider viaduct, trenches, or embankments cross-sections. Tracks and technological characteristics of the permanent way, and relative materials, are of course different according to the HS/HC or Conventional Network (i.e. switches with mobile heart).

- **Natural tunnels: On safety grounds, double track natural tunnels have been adopted only in case of lengths up to 1.25 miles, favoring instead, for further extensions, single track natural tunnels**. This configuration doubles the number of tunnels and consequently the number of the safety plants and provisions and of the connections with the surface to be provided. Also, already operating HS/HC tunnels (i.e. Firenze-Bologna Section) have been upgraded to the upmost standards.

Regarding delivery-wise implementation issues, our Italian experience demonstrates that large, integrated implementation turn-key contracts awarded to general contractors not necessarily were the cheapest solutions from a strictly economic point of view, mainly because of the high governance costs produced by the privates to coordinate the various actors of their organization.

The trade-off between more fragmented or more integrated solutions should however consider the costs of management of the Client organization (within the two different scenarios) and the schedule comparisons.

In any case, the main cost-drivers experienced in Italy suggests that for the Authority it would be advisable to evaluate the opportunity of a more specific procurement/delivery method for the most critical sections of the System, i.e. **the urban junctions**, the **connections** between the HS/HC Network and the Conventional one, and the chiefly **underground sections**.

For these critical sections, a delivery method that gives **preeminence to strong detailed design capabilities and to a strong construction management would be advisable**.

Given the enlightened key cost-drivers, the delivery model envisioned by the Authority could reduce costs and schedule in that it lowers the costly and time-consuming risks induced by interference and interface issues whenever non aptly managed. A strong **Construction Supervision, Interface and Integration Management and Supervision, and a specific System Assurance** become **critically important** in assisting the Authority steering such a challenging Project. It would then be advisable these critical activities were **not part of the comprehensive IOSs delivery currently envisioned**, becoming instead per se deliveries, each one precisely targeted on the peculiarities of the specific section.

11. *How does this compare to separately procuring each High-Speed rail component (i.e., separate contracts for civil works, rail, systems, power separately)? Please discuss design/construction costs, operating/maintenance/lifecycle costs, and schedule implications.*

As in the previous answers enlightened, the delivery method envisioned by the Authority for the IOSs appears to represent the **leveraged equilibrium between the advantages a comprehensive approach can grant, and the opportunity to reach in the near future the operation of a first IOS.**

Such comprehensive approach indeed shields from the most common risks that challenges as the System intended by the Authority face that are, the risk of overseeing in the initial phase compulsory issues that would become costly and time-delays factors if added later on, and the interface/integration risks.

However, the major risk experience enlightens in as challenging and complex Projects as the one the Authority is leading is an **original undervaluation of the Project**. This risk may be managed and even mitigated by applying, right from the start of the Project, the most accurate Design and Design Evaluation, according to each Design Phase, and the most meticulous Project Management and Construction Supervision during the Works.

Conversely to the benefits enlightened in the answer to the previous question, **a more fragmented delivery model could increase costs and schedule in that delays or costs related to interference and interface issues may arise**.

A strong unitary vision in the early stages of the design helps mitigate this risk, and the role of the Interface and Integration Management and Supervision and of the System Assurance, to be awarded

through per se deliveries, become crucial in enabling the Authority achieving its goals and successfully deliver the Project.

However, the delivery of the whole Project might greatly benefit, as previously enlightened, from a more specific delivery method precisely targeted on the peculiarities of the specific section, to be foreseen for the most critical sections of the System, i.e. the urban hubs, the connections between the HS/HC Network and the Conventional one, the chiefly underground sections, the systems and technologies.

A balance between the two options (a comprehensive delivery strategy, vs. a more discreet one) might be reached pursuing the actual delivery strategy foreseen by the Authority, with the caution of envisioning **more specific approaches where** – as above outlined – **needed**.

Eventually, the possibility to study "**optional**" components of the scope of work envisaged by the EOI delivery approach could be advisable. This contractual scheme – if feasible from a financial point of view - could increase, especially in case of bad performance by the Contractor, the Authority's flexibility in managing the vast package of activities awarded: for instance, eliminating by the scope of work of the consortium - at the right moment - portions of activities not yet started or for which not all of the functional requirements are already set.

12. *For each project, are there any technical changes to the respective scope of work that would yield cost savings and/or schedule acceleration while still achieving the Authority's objectives? If so, please describe.*

Wrapping up what enlightened in the course of the present expression of interest, the technical change to the scope of work that might be advisable the Authority evaluated may be briefly synthesized in:

- Accurately outline in further detail the scope of work whenever interfaces/integration needs may be foreseen
- Reserve the option to extend the technology/systems scope of work to cover a vast portion of the System
- Balance the scope of work of each delivery package so that the major players will be interested in joining, at the same time assuring a wide enough range of players will be incentivized to team up
- For specific key portions of the System, envision more specific delivery procedures apt to grant the interest of, and the award to, specific skilled and experienced Players
- Assure strong, skilled and precisely experienced Construction Management, Interface and Integration Management, System Assurance consulting activities by means of specific separate delivery procedures.

In order to enable the Authority to deliver within time and budget a new incisive, interoperable, innovative yet standardized state-of-the-art Systems for the Californa and its communities.